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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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05/06/1998

PAI-HUNG PAN

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EXAMINER

VU, HUNG K

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 12/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/073,494	PAN ET AL.	
	Examiner	Art Unit	
	Hung Vu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 23-26,29-31 and 34-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 23-26,29-31 and 34-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 23-26, 29-31, 34-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (PN 5,472,896, of record) in view of Tomozawa et al. (PN 4,782,037, of record).

With regard to claim 23, Chen et al. discloses a gate stack on a silicon substrate having a dielectric layer thereover, the dielectric layer being substantially devoid of pitting, the operable gate stack including a non-crystalline metallic silicide film (16) and a dielectric cap (22) on the non-crystalline metallic silicide film. Note Col. 4, lines 23-50 and Figures 1e and 3f. Also note that because a metallic silicide film (16) is in an amorphous state, it is inherent that the dielectric layer is substantially devoid of pitting.

Chen et al. discloses the dielectric cap is formed of oxide. Chen et al. does not disclose the dielectric cap is formed of silicon nitride. However, Tomozawa et al. discloses a dielectric cap (11) is formed of oxide or silicon nitride. Note Figures 1B and 9, and Col. 4, lines 45-54.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the oxide of Chen et al. by the silicon nitride of Tomozawa et al. because oxide and silicon nitride are commonly used as the material for the dielectric cap and they are interchangeable.

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Note that a term “the gate stack is operable” is a recitation of the intended use of the claimed invention which must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). The gate stack of Chen et al. and Tomozawa et al. is also operable.

With regard to claim 24, Chen et al. discloses a gate stack on a silicon substrate having a dielectric layer thereover, the dielectric layer being substantially devoid of pitting, the operable gate stack, including an amorphous metallic silicide film (16) wherein the metallic silicide film is substantially devoid of silicon clusters, a dielectric cap (22) on the non-crystalline metallic silicide film. Note Col. 4, lines 23-50 and Figures 1e and 3f. Also note that because the metallic silicide film is in an amorphous state, it is inherent that it is substantially devoid of silicon clusters and the dielectric layer is substantially devoid of pitting.

Chen et al. discloses the dielectric cap is formed of oxide. Chen et al. does not disclose the dielectric cap is formed of silicon nitride. However, Tomozawa et al. discloses a dielectric cap (11) is formed of oxide or silicon nitride. Note Figures 1B and 9, and Col. 4, lines 45-54.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the oxide of Chen et al. by the silicon nitride of Tomozawa et al. because oxide and silicon nitride are commonly used as the material for the dielectric cap and they are interchangeable.

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Note that a term “the gate stack is operable” is a recitation of the intended use of the claimed invention which must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). The gate stack of Chen et al. and Tomozawa et al. is also operable.

With regard to claim 25, Chen et al. discloses a gate stack on a silicon substrate (10) having a dielectric layer (12) thereover, the dielectric layer being substantially devoid of pitting, the operable gate stack comprising,

- a polysilicon layer (14) disposed over the dielectric layer;

- a non-crystalline metallic silicide film (16) disposed over the polysilicon layer;

a dielectric cap (22) on the non-crystalline metallic silicide film. Note Col. 4, lines 23-50 and Figures 1e and 3f. Also note that because the metallic silicide film is in an amorphous state, it is inherent that it is substantially devoid of silicon clusters and the dielectric layer is substantially devoid of pitting.

Chen et al. discloses the dielectric cap is formed of oxide. Chen et al. does not disclose the dielectric cap is formed of silicon nitride. However, Tomozawa et al. discloses a dielectric cap (11) is formed of oxide or silicon nitride. Note Figures 1B and 9, and Col. 4, lines 45-54.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the oxide of Chen et al. by the silicon nitride of Tomozawa et al. because

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oxide and silicon nitride are commonly used as the material for the dielectric cap and they are interchangeable.

Note that a term “the gate stack is operable” is a recitation of the intended use of the claimed invention which must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). The gate stack of Chen et al. and Tomozawa et al. is also operable.

With regard to claim 26, Chen et al. discloses a gate stack structure comprising an operable gate stack on a dielectric layer (12), over a silicon substrate (10), wherein the dielectric layer is substantially devoid of pitting, the operable gate stack comprising a metallic silicide film (16) and a dielectric cap (22) on the metallic silicide film. Note that because a metallic silicide film (16) is in an amorphous state, it is inherent that the dielectric layer is substantially devoid of pitting. Note Col. 4, lines 23-50 and Figures 1e and 3f.

Chen et al. discloses the dielectric cap is formed of oxide. Chen et al. does not disclose the dielectric cap is formed of silicon nitride. However, Tomozawa et al. discloses a dielectric cap (11) is formed of oxide or silicon nitride. Note Figures 1B and 9, and Col. 4, lines 45-54.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the oxide of Chen et al. by the silicon nitride of Tomozawa et al. because

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oxide and silicon nitride are commonly used as the material for the dielectric cap and they are interchangeable.

Note that a term “the gate stack is operable” is a recitation of the intended use of the claimed invention which must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). The gate stack of Chen et al. and Tomozawa et al. is also operable.

With regard to claim 29, Chen et al. discloses a semiconductor device comprising at least one gate stack formed on a silicon substrate having a dielectric layer thereover, the dielectric layer being substantially devoid of pitting, the at least one gate stack comprising a non-crystalline metallic silicide film (16) and a dielectric cap (22) on the non-crystalline metallic silicide film. Note Col. 4, lines 23-50 and Figures 1e and 3f. Also note that because a metallic silicide film (16) is in an amorphous state, it is inherent that the dielectric layer is substantially devoid of pitting.

Chen et al. discloses the dielectric cap is formed of oxide. Chen et al. does not disclose the dielectric cap is formed of silicon nitride. However, Tomozawa et al. discloses a dielectric cap (11) is formed of oxide or silicon nitride. Note Figures 1B and 9, and Col. 4, lines 45-54.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the oxide of Chen et al. by the silicon nitride of Tomozawa et al. because

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oxide and silicon nitride are commonly used as the material for the dielectric cap and they are interchangeable.

With regard to claim 30, Chen et al. and Tomozawa et al. disclose the at least one gate stack further comprising,

a polysilicon layer (14) disposed over the dielectric layer,

the non-crystalline metallic silicide film (16) being disposed over the polysilicon layer.

With regard to claim 31, Chen et al. discloses a semiconductor device comprising at least one gate stack structure on a dielectric layer (12), over a silicon substrate (10), wherein the dielectric layer is substantially devoid of pitting, the at least one gate stack structure comprising a metallic silicide film (16) and a dielectric cap (22) on the metallic silicide film. Note Col. 4, lines 23-50 and Figures 1e and 3f. Also note that because a metallic silicide film (16) is in an amorphous state, it is inherent that the dielectric layer is substantially devoid of pitting.

Chen et al. discloses the dielectric cap is formed of oxide. Chen et al. does not disclose the dielectric cap is formed of silicon nitride. However, Tomozawa et al. discloses a dielectric cap (11) is formed of oxide or silicon nitride. Note Figures 1B and 9, and Col. 4, lines 45-54.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the oxide of Chen et al. by the silicon nitride of Tomozawa et al. because oxide and silicon nitride are commonly used as the material for the dielectric cap and they are interchangeable.

Response to Arguments

2. Applicant's arguments filed 02/02/04 and 09/13/04 have been fully considered but they are not persuasive.

It is argued, at pages 9-12 of the Remarks, that Chen et al. does not disclose the gate stack structure including an amorphous metallic silicide film. This argument is not convincing because Chen et al. disclose, as shown in Col. 4, lines 23-50 and Figures 1e and 3f, the gate stack structure including an amorphous metallic silicide film. Also note that because a metallic silicide film (16) is in an amorphous state, it is inherent that the dielectric layer is substantially devoid of pitting. Note that the examiner uses the intermediate structure of the gate stack before thermal treatment of the refractory metal silicide. The gate stack of Chen et al. and Tomozawa et al. is also operable since a term "the gate stack is operable" is a recitation of the intended use of the claimed invention which must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). The gate stack of Chen et al. and Tomozawa et al. is also operable. Therefore, Applicants' claims 23-26, 29-31, 34-44 do not distinguish over the Chen et al. in view of Tomozawa et al.

Conclusion

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (571) 272-1666. The examiner can normally be reached on Mon-Thurs 6:00-3:30, alternate Friday 7:00-3:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The Central Fax Number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

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Vu

November 17, 2004

A handwritten signature in black ink, appearing to read "Hung Vu", written over a horizontal line.

Hung Vu

Patent Examiner